

Ex/M.Sc/Math/22/4.4/B2.16/2018

MASTER OF SCIENCE EXAMINATION, 2018

(2nd Year, 2nd Semester)

MATHEMATICS

Unit - 4.4 (B-2.16)

[Elastodynamics-II]

Full Marks : 50

Time : Two Hours

The figures in the margin indicate full marks.

(Symbols/Notations have their usual meanings)

Answer Question No. 1 and any *two* from the rest.

1. Solve Sommerfield's problem of diffraction of elastic waves by a semi-infinite crack exciting in an infinite elastic medium when plane SH-wave given by

$$W_i = e^{-ik_2(x\cos\theta + y\sin\theta) - i\omega t}$$

is incident.

20

Or;

Deduce the frequency equation for the longitudinal vibration of an infinite circular cylinder. Show that for large wave-length compared to the radius of the cylinder, longitudinal waves

propagate with phase velocity $C = \sqrt{\frac{E}{\rho}}$. 20

[Turn over]

[2]

2. Obtain the components of stresses and displacements at any point due to two-dimensional line load given by $\tau_{yy} = -P\delta(X+Ut)$ moving steadily at a subsonic speed on the free surface $Y=0$ of a semi-infinite medium. 15
3. Deduce displacement components for the inplane problem due to a time harmonic line source of force given by $\rho\vec{F} = (2\pi\rho\delta(x)\delta(y)e^{-i\omega t})\vec{i}$.
situated at the origin of co-ordinates in an infinite elastic medium. 15
4. Obtain the expressions for stresses when a SH-wave is scattered by an infinite cylindrical cavity of radius 'a' in an infinite elastic medium. 15
